Chapter 5. Benefits

5.1 Economic Development

Advanced telecommunications is the key infrastructure for today's digital economy. The economies of California, the nation and the world are increasingly powered by the creation, use and transmission of information and entertainment content in digital format. Just as the telegraph transformed management of the far-ranging railroad networks of the 19th century, and the telephone enabled coordination of businesses with widespread operations in the 20th century, the digital communications infrastructure is transforming business activities on a global scale and in real-time in this century. The widespread deployment and use of broadband will spur the creation of entire new industries, transform existing ones and, like the automobile industry's impact on horse-drawn carriage manufacturers, displace others.

The deployment of broadband infrastructure impacts the economy both directly and indirectly. The cable industry alone has invested over $65 billion since 1996 upgrading its systems to provide digital content. Verizon is poised to spend up to $40 billion in the coming years to deploy a FTTP network.

Yet, the effects of broadband technology on the economy are much more far-reaching than the direct benefit created by capital investment in deployment and the manufacturing of the components such a network requires. The most significant economic benefits do not come from the deployment of broadband technology, but in its use. As broadband penetration increases, there will be resulting demand for computer and home network equipment, software applications, wireless devices and other equipment that utilize broadband. Like all infrastructure investment, the economic impacts of broadband will also include the increased productivity and innovation that it fosters. The full economic impact of widespread broadband deployment and adoption cannot be captured in even the most sophisticated econometric modeling.

5.2 Quantifying the Economic Benefits of Broadband Deployment

Several studies have attempted to quantify the economic impacts, particularly increases in employment and economic activity, that can either be directly or indirectly liked to increased deployment of broadband technologies. For example, one study sponsored by Cisco Systems, written by Hal Varian of the University of California and Robert Litan of the Brookings Institute, found that full implementation of currently underway or planned Internet business solutions could result in over $528 billion in cost savings to U.S. businesses though 2010.[87] Additionally, this study finds that these solutions could result in a cumulative increase of over $1.5 trillion in revenue to businesses resulting from implementation of Internet business solutions. While this study looked broadly at Internet based business solutions, and not just those enabled by broadband, this information is nevertheless illustrative of the significant benefits advanced telecommunications can have on business and on economic growth.

[87] Varian Litan, Elder, and Shutter, "The Net Impact Study: The Projected Economic Benefits of the Internet in the United States, United Kingdom and Germany," January 2002.

Figure 5.1
Broadband Investment Projections

Required Investment	Description
About $1300 per line, $270 billion total	Figures for DSL.; Reflects costs necessary to retrofit all US copper plant
About $1200 per line, $65 billion total	Figures for Cable-modem; Reflects past investment through 2002
More than $1250 per line, total investment would vary based on platforms used	Figures for "Ultraband" fiber connections; $1250 reflects customer expenses, not upstream capital and communication costs
About $700 per line, $63 billion total[88]	Figures for wiring additional 75% of US households with current technologies (cable or DSL)
About $900 per home passed and $2200 per home served by the technology, $93 billion total[89]	Weighted average calculated from 2003 to 2021, for investment in FTTP technology

The wide-ranging deployment of broadband infrastructure will have the direct effect of employing thousands of people: to manufacture, sell, purchase, install, manage, and maintain the equipment and facilities, as well as the resulting services.

Only a few studies have examined the issue of job development resulting from greater broadband investments, although many other publications and documents reference them.

Figure 5.2
Job Growth Due to Broadband Deployment

SOURCE	U.S. JOBS	CA JOBS
TeleNomic Research, 2002[90]	1.2 million	100,000
Critereon Economics, 2003[91]	1.2 million	N/A
CENIC/Gartner Consulting, 2003[92]	N/A	2 million

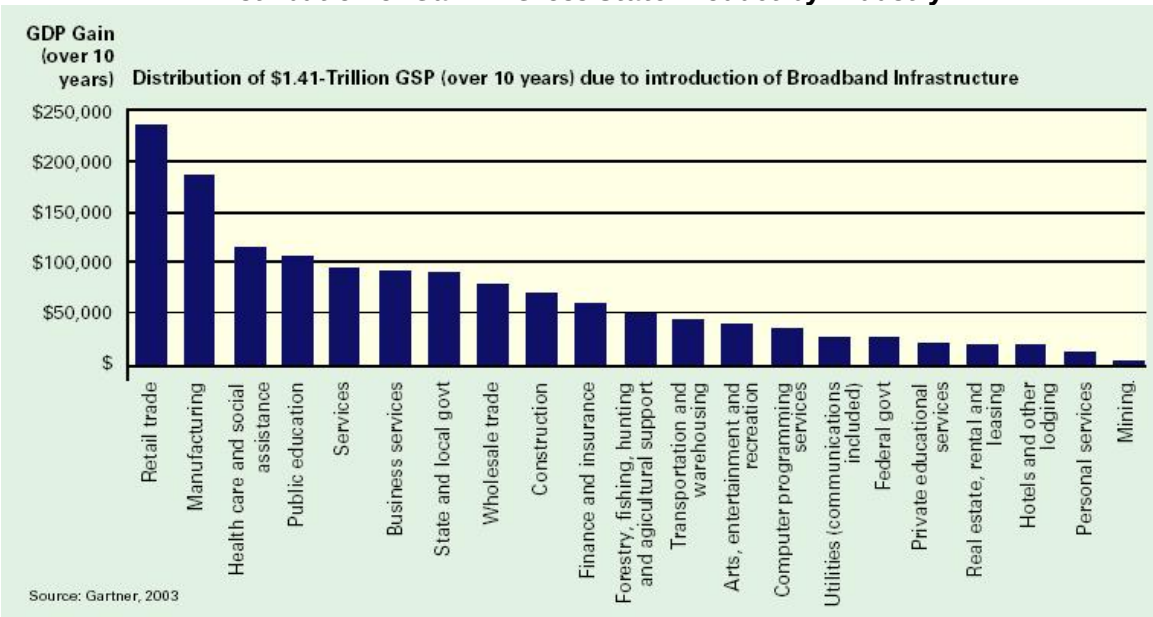
[88] Per line figure calculated using data from http://quickfacts.census.gov/qfd/states/00000.html.
[89] Staff found some variation in these projections.
[90] S. Pociask, "Building a Nationwide Broadband Network: Speeding Job Growth," TeleNomic Research, LLC, February 2002; http://www.newmillenniumresearch.org/event-02-25-2002/jobspaper.pdf.
[91] R. Crandall, C. Jackson, H. Singer, "The Effects of Ubiquitous Broadband Adoption On Investment, Jobs and the US Economy," Criterion Economics, LLC, September 2003; http://www.newmillenniumresearch.org/archive/bbstudyreport_091703.pdf.
[92] Gartner Consulting, "One Gigabit or Bust Initiative: A Broadband Vision for California," May 2003; http://www.cenic.org.

5.2.1 The CENIC/Gartner Study

The Gartner Group, a technology and market research and consulting firm, was engaged by the Corporation for Education and Network Initiatives in California (CENIC) to evaluate the economic potential of accelerating next generation broadband deployment in California.

Gartner studied the impact that a 50% penetration by 2010, i.e. one broadband line for every two people in California, would have on economic activity and employment. [93] Gartner's modeling shows an increase of $376 Billion in incremental Gross State Product (GSP) over a ten-year period. This increase would result in a $5,500 increase in annual per capital GSP. Gartner then sought to quantify theses economic impacts by sector of the economy. The following chart illustrates the study's results.

Figure 5.3
Distribution of Gain in Gross State Product by Industry



Source:
CENIC's One Gigabit or Bust Initiative: A Broadband Vision for California Summary Report
http://www.cenic.org/gb/pubs/gartner/Gartner_Short.pdf

Retail trade, manufacturing, health and social assistance, and public education see the largest positive economic impacts of accelerated broadband deployment.

Gartner also studied the impacts such accelerated deployment would have on employment and found the potential to create two million additional jobs in California over the ten-year study period.

[93] The equivalent penetration of basic telephony in California is approximately 73% on a per capita basis.

5.2.2 The TeleNomic Research Study[94]

A study conducted by TeleNomic Research found substantial employment gains from increased broadband deployment. The major finding of this study is that building and using a robust, nationwide network will expand U.S. employment by an estimated 1.2 million new and permanent jobs. Specifically, TeleNomics found:

- 166,000 jobs would be created directly in the telecommunications sector;
- 72,000 manufacturing jobs would be generated by the direct purchase of network plant and equipment and customer premise equipment; and
- 974,000 indirect jobs would be created if a next generation network were built.[95]

TeleNomic Research estimated that about 237,000 jobs nationwide would be created directly from broadband deployment. To this, the study adds jobs created indirectly from the deployment and use of broadband, such as content providers and software developers, who create new products that utilize the broadband networks. This indirect effect also includes jobs created by the increased spending of those whose jobs were directly linked to broadband deployment. The study finds that the effects of greater broadband deployment will ripple though the economy, increasing employment even more. TeleNomic estimates that over 4 indirect jobs will be created for every 1 new job directly resulting from the deployment of broadband.[96]

5.2.3 The Criterion Economics Study[97]

Robert Crandall and his associates at Criterion Economics completed a study in 2003 looking at the effects of ubiquitous broadband adoption on the U.S. economy. The study considers 95% penetration to be ubiquitous broadband adoption and assumes that this level of penetration is reached in 2021.[98] This study estimated that for every $1 million in capital investment in telecommunications networks, there are 18 jobs created. This leads the study to project that an average of 140,000 direct jobs would be created by the increase in capital investment engendered by widespread deployment of broadband. The indirect jobs created are estimated to be approximately 664,000, leading to a total of 804,000 new jobs.

The study also concluded that widespread deployment of broadband technologies could result in increased economic activity of $414 billion in additional economic output for the nation.

This study also examined the impacts of an even more rapid deployment of broadband and finds that under a scenario where 95% penetration is reached in 2013 (rather than 2021) as many as 546,000 additional new jobs would be added.[99] This results in a total addition of 1.2 million jobs to the U.S. economy.

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[94] S. Pociask "Building a Nationwide Broadband Network: Speeding Job Growth," TeleNomic Research, LLC, February 25, 2002. http://www.newmillenniumresearch.org/event-02-25-2002/jobspaper.pdf.
[95] Ibid., p. 2.
[96] Ibid., p. 7.
[97] R. Crandall, C. Jackson, H. Singer, "The Effects of Ubiquitous Broadband Adoption On Investment, Jobs and the US Economy," Criterion Economics, LLC, September 2003; http://www.newmillenniumresearch.org/archive/bbstudyreport_091703.pdf.
[98] To achieve this level of penetration broadband subscribership must increase by about 9.4% per year from 2004 through 2021.
[99] The study shows that employment peaks in 2010 at 546,000 and averages approximately 271,000 though 2021.

The Criterion Study also attempted to measure the additional benefits to consumers of broadband deployment by measuring consumer surplus. Consumer surplus is defined as the measure of the net benefit that new or improved goods and services bring to consumers. Given the tremendous value that broadband can provide to consumers, the study found significant gains in consumer benefit and found that the more ubiquitous the deployment the greater the consumer gains.

At 50% broadband penetration, the Criterion Economics study finds that additional value to consumers would rise to between $64.4 billion and $96.6 billion per year depending on price elasticity. If broadband service were to become truly ubiquitous, similar to ordinary telephone service at 95% penetration, this study concludes that the additional value to consumers - over and above their expenditures on the service - would be between $234 billion and $351 billion per year.

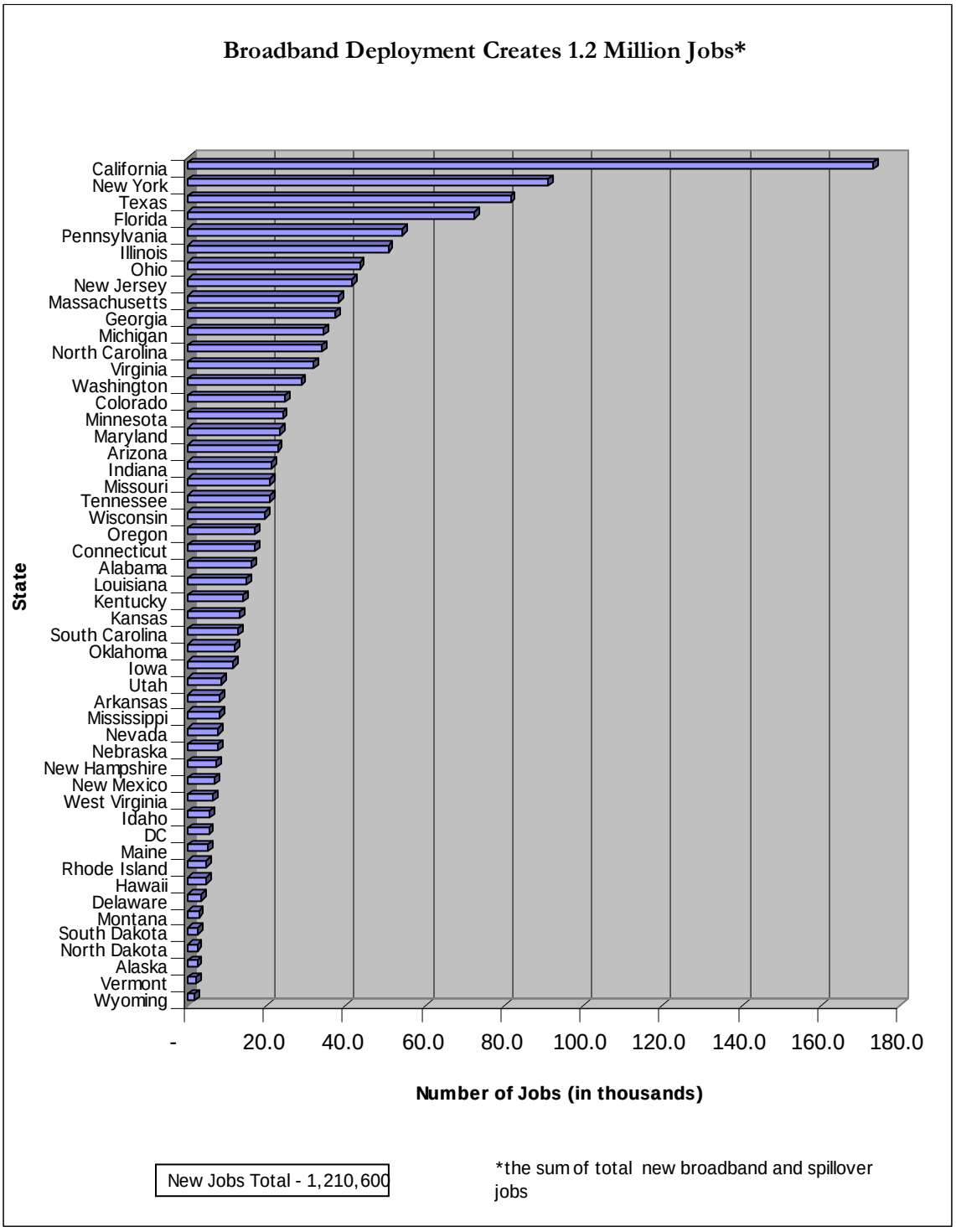
5.2.4 The Citizens for a Sound Economy Study

Citizens for a Sound Economy (CSE) published a study by Wayne T. Brough, Ph.D., which took the results of the Criterion study and sought to estimate the employment impact by state.[100] This study estimated that California would see an increase in employment of over 170,000 new jobs. The CSE study found that California would gain over 96,000 direct jobs. This would be expected given California's large information technology sector. For comparison, CSE estimates that Florida and New York would see gains of over 40,000 jobs as a direct result of broadband deployment. California would also see over 76,000 new jobs through the indirect impacts of broadband deployment, according to the study.

The findings of the study are illustrated in Figure 5.4 which follows.

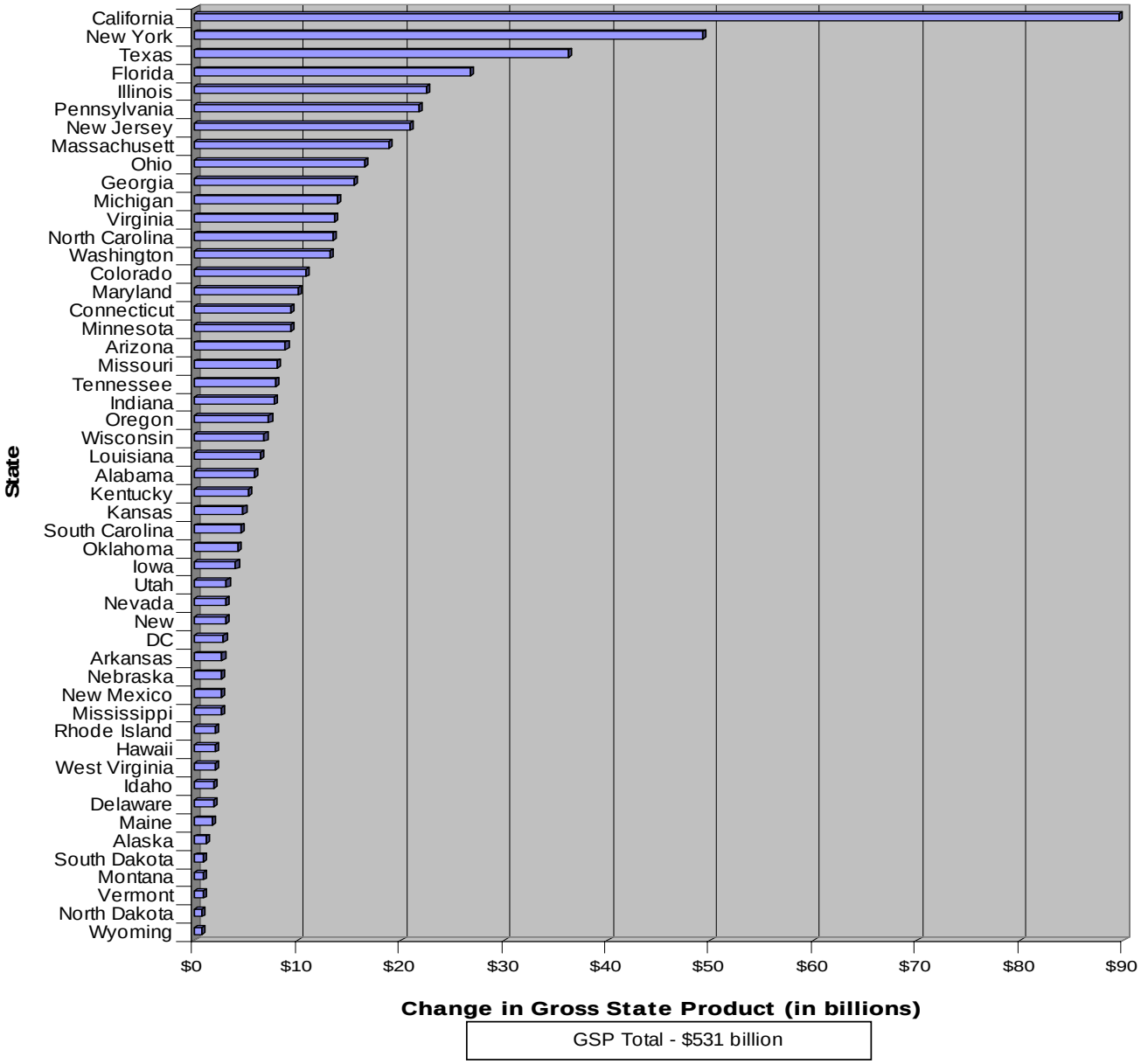
[100] Wayne T. Brough, "State Economies Can Benefit from Broadband Deployment," Center for a Sound Economy, December 1, 2003.

Figure 5.4



The CSE study also calculates that widespread broadband deployment could add over $500 billion to the U.S. economy and calculates that California would add over $90 billion to its economic output due to increased broadband deployment. Given California's large information technology and entertainment industries, California gains from increased broadband deployment in other states, as well as the benefits it derives from deployment within California.

Figure 5.5
Economic Output Increases by State



5.3 New Products and Services

Broadband will provide consumers with significant bandwidth, that will in turn encourage the development of new services, applications and hardware for consumers. The range of new products and services will only be limited by the imagination of innovators and the interests and demands of consumers.

5.3.1 Telemedicine

Telemedicine and eHealth are broadly defined as the application of electronic communication technologies to the provision of healthcare, health education and health services. The two terms are frequently used interchangeably. Many, if not all, Telemedicine applications require access to broadband services. A major goal of the delivery of Telemedicine and eHealth services is to eliminate barriers of time and distance to allow health service and education to reach individuals in their own communities, instead of the movement of people to centers of healthcare expertise.

Telemedicine applications will benefit from the proliferation of expanded broadband networks. Telemedicine applications can use broadband to transmit detailed medical images, as well as for videoconferencing to connect healthcare clinics in remote rural locations with experts and specialists located primarily in urban centers. In this way, rural clinics and hospitals can have access to the same medical expertise that is available in the most sophisticated urban hospitals. Telemedicine applications can allow health care professionals to monitor a patient's health remotely and, using videoconferencing technologies, can have access to critically needed specialists.

Over the past five years, California has become known as a telemedicine and eHealth leader. California was one of the first states to allow Medicaid reimbursement for telemedicine and eHealth services. The California Telemedicine and eHealth Center (CTEC)[101] funded by The California Endowment, is an example of one organization in the state committed to reducing health disparities through strategic application of telecommunications and eHealth technologies.

CTEC has made significant contributions toward increasing the technological expertise of California health care organizations through capacity building, training, education, and regranting. In particular, CTEC has emerged as the primary source for hospitals and clinics in promoting the use of telemedicine and eHealth within underserved communities. CTEC provides funding and resources to expand and develop regional eHealth networks throughout California using health technologies to improve the provision of health services to rural and underserved communities.

> **Case Study: eMental Health – Enhancing Mental Health Services for the Underserved.** CTEC funded the UC Davis eMental Health Project. This project has been highly successful in demonstrating new and innovative ways to provide mental health care services to rural populations. This project was developed to provide critically needed psychiatric services for ten rural community clinics that have a documented need for increased mental health care services and resources, where these services were not available. The UC Davis multidisciplinary consultation-liaison team provides professional expertise (advice and consultations) via Telemedicine and other communication technologies on the management of patients who are seen at the selected rural sites, especially for complex and /or urgent mental health issues. This project offers a choice of urgent and non-urgent consultations by phone, fax, email/internet, or videoconferencing. The services administered to the rural sites include: triage consultation, clinical psychologist, psychiatric consultations, medication management, and counseling services. In just over six months, the project staff has seen over 150 clients, in which 50% of those clients have been children.

[101] See www.cteconline.org.

Rural sites are provided with the most up-to-date information on best practices as well as easily accessible resources and professional expertise from the staff at the UC Davis Medical Center (UCDMC). Along with providing clinical services to the rural sites, the UCDMC faculty also provides a regular program of fully accredited continuing medical education lectures and seminars. Over 100 rural providers have received education on the treatment of depression, anxiety, dementia and psychiatric illnesses in the medically ill. The additional services made available through this unique project have aided in the acceptance, support, and overall success of the consultation-liaison model at the ten participating rural sites.

5.3.2 VoIP

The most prominent example of how broadband has resulted in innovative new services is the development of VoIP (Voice over Internet Protocol). VoIP allows high quality two-way voice transmission over broadband connections, and is already revolutionizing the telecommunications industry.[102] While the commercial deployment of VoIP is relatively new and there are still important public policy issues raised by its emergence such as e911 and support for Universal Service programs, analysts predict that between 2004 and 2008, the number of VoIP connections will increase from about 800,000 to 17 million.[103]

Calls made using IP technology or over the public Internet provide significant cost savings to consumers by eliminating most per minute long distance and local toll charges. Many VoIP providers are offering unlimited local and long distance calling plans for as low as $19.95 per month.[104] In addition to significant cost savings, VoIP facilitates advanced applications and capabilities including mobility, location independence including choice of area code, integrated messaging applications, voice access to e-mail and a common mailbox for voice, e-mail and Instant Messaging.

5.3.3 Video on Demand

Cable companies and Broadband Overbuilders already offer television and video over their broadband networks. Telephone companies are seeking to offer similar services, delivering their own "triple play" to consumers. SBC and set-top box vendor 2Wire this year will offer TV, video on demand, digital video recording and Internet content over DSL and satellite service.[105] The increased capacity of these broadband networks combined with advances in data storage technology will spur increased Video on Demand applications.

5.3.4 Smart Homes

Homeowners can utilize broadband technologies to control the electronic devices in the home remotely. Lighting, heating and air conditioning, appliances, and home security and other systems can now be remotely monitored and controlled. In addition, advanced energy metering technology in the home will allow consumers to control their energy demand and respond to market signals.

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[102] http://www.businessweek.com/technology/content/sep2004/tc20040921_7486_tc024.htm.
[103] Suzanne Vranica, "No Nerds Needed: VOIP Is No Longer Just for Techies," Wall Street Journal, November 3, 2004; http://online.wsj.com/article/0,,SB109943061445662597,00.html.
[104] See "Freedom Unlimited," www.packet8.net.
[105] "SBC, 2Wire Inc. to Launch Home Entertainment Services," Sacramento Business Journal, January 4, 2005.

5.3.5 Gaming

Online interactive video and computer gaming is increasingly a leading driver of broadband deployment and use. It is forecast that the worldwide market for online games will reach $9.8 billion in 2009, a 410% increase over 2003 revenue of $1.9 billion.[106] Broadband applications can provide gamers with the ability to connect directly with interactive, multi person, high-resolution, fast action, and complex online games. Broadband gaming technologies that create virtual-reality environments could be a precursor to sophisticated training and simulation applications with a myriad of uses in industrial, entertainment, military, and commercial settings.

5.4 Teleworking and Telecommuting

In 2004, a report sponsored by the International Telework Association and Council found that the number of Americans who worked at least part time from home increased 7.5% from 2003, to a total of 44.4 million workers. The report also found that during that same one year period, the number of teleworkers using broadband soared 84%, from 4.4 million to 8.1 million employees.[107] Companies can use broadband to enable employees scattered around the globe to communicate and share information in real-time. Employees working from home or in branch offices are able to work with colleagues in other offices as easily as if they sitting in adjacent cubicles. Broadband allows telecommuting to serve as a practical alternative to office-based employment. In addition to the efficiencies realized by employers from lower overhead costs, telecommuting results in significant benefits to the environment,[108] results in greater worker productivity and job satisfaction, as well as the expansion of employment opportunities to those with disabilities.[109]

California was a pioneer in exploration and adoption of telecommuting by state employees. In 2003, the state published a guide to assist agencies plan and implement teleworking/telecommuting programs.[110]

5.5 Benefits to Public Agencies and E-Government

Government can increase the number and level of public services available to citizens by putting new and existing services online.[111] Union City, California has announced that it is replacing the telephone crime reporting system now in use with a system that will allow residents to file certain crime reports from their homes through the Internet. The new system will be less stressful for victims, eliminating games of "phone tag," while it eases the workload on community service aides and police officers. The $20,000 cost is projected to save the city $85,000 in salary and benefits annually.[112]

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[106] DFC Intelligence Forecasts Significant Growth for Online Games, August 3, 2004; http://www.dfcint.com/news/praug32004.html.

[107] "Work at Home Grows in Past Year by 7.5% in U.S.; Use of Broadband for Work at Home Grows by 84%," Press Release of International Telework Association and Council, September 2, 2004; http://www.telecommute.org/news/pr090204.htm.

[108] See AT&T's Telecommuting Calculator at www.att.com/telework/calculator.html, which permits workers to calculate carbon dioxide emissions saving by telecommuting.

[109] Burt Helm, "Paving the Road for Telecommuters," BusinessWeek, September 29, 2004; Ben Macklin, "The Benefits of Broadband: Telecommuting," Entrepreneur, May 6, 2002.

[110] http://www.dpa.ca.gov/telework.

[111] Herndon, Virginia Helps Locate Missing Children with PhoneTop AMBER Alerts and Cisco IPC System, February 9, 2004; http://newsroom.cisco.com/dlls/2004/hd_020904b.html

[112] www.ci.union-city.ca.us/default.htm.

As broadband becomes more widespread, public safety authorities will be able to develop systems for providing public safety alerts via the Internet. For example, the town of Herndon, Virginia is using its VOIP-based network to broadcast Amber Alerts to the IP based phones in local government offices.

Broadband allows local government jurisdictions to host Internet community forums and provide multimedia communication services on websites. Additional benefits of such e-government include eliminating the time and transportation costs involved with visiting local government offices.

Similar to the benefits realized by private companies, broadband is also helping to reduce paperwork and cut costs for government. California State Controller Steve Westly has advanced a wide-ranging set of e-government proposals designed to save as much as $37.5 million annually by making the state more efficient at handling everything from tax returns to travel vouchers. Electronic filing of tax returns and refunds alone are expected to save up to $7.5 million each year. On-line processing of travel claims, payroll and benefits for state workers will bring additional savings of up to $29 million each year.[113]

Increased deployment of advanced telecommunications services including broadband will also have a positive impact on revenues to state and local government. Increased employment will generate higher income tax revenues, and increased economic activity will create additional sales tax revenues. Furthermore, the capital expenditures to deploy broadband networks will increase the property tax base.

5.6 Benefits for the Disabled Community

Broadband services are particularly beneficial to the disabled community. For example, video phones with closed caption technology can greatly increase the ability to communicate for those within the deaf community. High-resolution computer screens and voice-activated programs can aid the visually impaired, and with software such as eBooks, everything from novels to textbooks can be downloaded. For the physically disabled and the elderly, the Internet, especially with a broadband connection, provides a means for them to connect and communicate with the world.

Wireless broadband offers another opportunity for the disabled. Rather than using a desktop computer, a wheelchair bound consumer with a mounted notebook computer can access the Internet from anywhere in his/her home. With voice-activated dialing, a physically disabled or visually impaired consumer can communicate more effectively and easily using VoIP over a wireless broadband connection.

[113] "Westly Outlines E-Government Agenda," May 12, 2004; http://www.controller.ca.gov/eo/pressbox/index.shtml.

5.7 Benefits for Rural Areas

Broadband infrastructure can be a critical element in assisting a rural community to compete economically within the overall global business climate.[114] Broadband infrastructure assists rural communities in attracting businesses, providing health care to residents and accessing government services. Broadband can serve as a critical link to information and news for communities that have limited newspaper, radio and television station choices. Access to broadband infrastructure can also improve the quality of education available to small population communities. For, example the California Mother Lode region - including Amador, Mariposa, Tuolumne, Calaveras, Inyo and Mono counties - has no state college or university and only one community college within the area's 18,546 square miles. High-speed Internet connections allow Mother Lode residents to access technology training and educational opportunities provided through the Golden Gate University's Cyber Campus. Students can remain in their communities, receive Bachelors and Master degrees online and with their advanced education, contribute to the economic vitality of the region.[115]

5.8 Benefits for Low Income Consumers

Increasingly, access to computers and the Internet are necessary for academic success and better-paying jobs . Broadband offers access to training, services and educational advancement that allows low-income consumers to improve their skills, access critical services such as health care, and actively participate in the new digital economy

There are surprisingly few studies measuring the benefits of broadband to lower income consumers.[116]

> **Case Studies: Reaching out to Low Income Consumers**
> The Eastmont Computing Center in Oakland provides broadband Internet access, computer courses and job placement services to approximately 500 people per week.[117] The Latino Issues Forum conducts computer technology and Internet literacy projects in low-income urban and rural schools.[118] The Signature Learning Project and the Rural Technology and Information Project are model public, private and nonprofit partnerships created to develop comprehensive technology learning environments for low income and minority communities.[119]

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[114] "Public Policy Roadmap for Improving Broadband Access," New Valley Connexions, December 2003, p. 16.
[115] Amador-Tuolumne Community Action Agency, Opening Comment in R. 03-04-003.
[116] One study found that children of school age increased their use of a personal computer for education-related purposes by 19%, while decreasing their use for gaming and entertainment by 21%, when those computers were equipped with broadband connections. 2004 British Telecom Study; www.unreasonableman.net/2004/09/broadband_has_p.html.
[117] Latino Issues Forum and Greenlining Institute, Opening Comments in R. 03-04-003.
[118] Ibid.
[119] Latino Issues Forum and Greenlining Institute, Opening Comments in R. 03-04-003, Appendix A: Model for closing Technological and Educational Disparities in Underserved Communities.